Abstract

A material processing system including a process tool and a process performance prediction system. The performance prediction system includes sensors coupled to the tool to measure tool data and a controller coupled to the sensors to receive tool data, where the controller is configured to predict the process performance for the tool using the tool data. A method for detecting a fault in a material processing system using a process performance prediction model is also provided. The method includes preparing the tool, initiating a process in the tool, and recording tool data to form to a tool data matrix. The method also includes performing a matrix multiplication of the tool data matrix and a correlation matrix to form predicted process performance data, where the correlation matrix includes the performance prediction model, comparing the predicted data with target data, and determining a fault condition of the processing system from the comparing step.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(71) Applicant *(for all designated States except US)*: **TOKYO ELECTRON LIMITED** [JP/JP]; 3-6, Akasaka 5-chome, Mianto-ku, Tokyo 107-8481 (JP).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **LAM, Hieu, A.** [US/US]; 5808 Abingdon Drive, Richardson, TX 75082 (US). **YUE, Hongyu** [US/US]; 5705 Janabyrd Lane, Austin, TX 78749 (US). **SHRINER, John** [US/US]; 1420 Lomond Ct., Allen, TX 75013 (US).
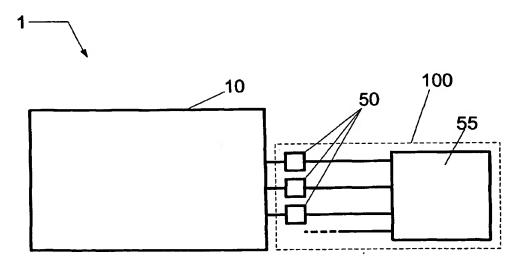
(74) Agent: CASE, Michael, R.; OBLON, SPIVAK, Mc-CLELLAND, MIER & Neustadt, P.C., 1940 Duke Street, Alexandria, Virginia 22314 (US).

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR PREDICTING PROCESS PERFORMANCE USING MATERIAL PROCESSING TOOL AND SENSOR DATA

(57) Abstract: A material processing system including a process tool and a process performance prediction system. The performance prediction system includes sensors coupled to the tool to measure tool data and a controller coupled to the sensors to receive tool data, where the controller is configured to predict the process performance for the tool using the tool data. A method for detecting a fault in a material processing system using a process performance prediction model is also provided. The method includes preparing the tool, initiating a process in the tool, and recording tool data to form to a tool data matrix. The method also includes performing a matrix multiplication of the tool data matrix and a correlation matrix to form predicted process performance data, where the correlation matrix includes the performance prediction model, comparing the predicted data with target data, and determining a fault condition of the processing system from the comparing step.